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Office of the Secretary
Federal Communications Commission
Washington, D.C. 20554

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Attention: William F. Caton
Acting Secretary

Dear Mr. Caton:

Enclosed is an original and five (5) copies of **Concepts To Operations, Inc. (CTO)** comments on WT Docket 95-47 "Notice of Proposed Rule Making," concerning mobile services for IVDS.

Sincerely,

Stanley I. Cohn
Executive Vice-President

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Enclosures

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**Before the
Federal Communications Commission
Washington, D.C. 20554**

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JUN 26 1995

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In the Matter of)

Amendment of Part 95 of the)
Commission's Rules to allow)
Interactive Video and Data)
Service licensees to provide)
mobile service to subscribers)

WT DOCKET NO. 95-47

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Reference: Notice of Proposed Rule Making adopted April 13, 1995: RM-8476

I. INTRODUCTION

Concepts To Operations, Inc. submits the following comments regarding the subject Notice of Proposed Rule Making, Amendment to Part 95 of the Commissions Rules to allow Interactive Video and Data Service licensees to provide mobile service to subscribers. In this proceeding the Commission proposes to allow mobile operation of RTUs as an ancillary service with power levels restricted to 100 milliwatts.

These comments support the use of mobile RTUs, note the differing interference characteristics between fixed and mobile IVDS services and point out the effects of mobility on IVDS system characteristics. The specific comments given involve allowing licensees to cope with interference to Channel 13 on a flexible basis by relaxing and or removing unnecessary technical restrictions.

II. INTERFERENCE CONSIDERATIONS

The use of mobile RTUs present interference situations to TV Channel 13, which in certain cases, may be more severe than those involving fixed RTUs.

When EON reduced the maximum power of their fixed RTUs from 20 watts to 100 milliwatts, they significantly reduced the interference potential in terms of reduced distance at which an RTU could cause interference. However, the use of 100 milliwatts for RTUs does not completely eliminate interference. In measurements made by Radio Telecomm & Technology, Inc.^{1,2} concerning adjacent channel interference to TV Channel 28, it was found that perceptible interference occurred at TV receivers located at 54 ft. (equivalent distance to either adjacent or across the street homes) at interfering transmitter levels of 50 microwatts (immediately adjacent frequency of Channel 29) to 250 microwatts (at the upper end of Channel 29). The measured signal level of Channel 28 was 77dBu which was higher than the Grade A contour level. The values in the range of 2 to 3 MHz above the upper end of Channel 29 were of the order of 100 microwatts. If translated to the IVDS (218-219 MHz) interference to TV Channel 13 (210-216 MHz) situation the corresponding power levels that would cause perceptible interference at 54 ft. would be about 6.7 times less or about 15 microwatts. If further translated to near the edge of the Grade B contour region, interference levels of about 1.0 microwatts could be detectable by a Channel 13 viewer.

An analysis of the adjacent channel interference to Channel 13 situation can be made using an interfering source of 100 milliwatts against a TV receiver at a distance of 54 ft. Adjacent channel rejection of approximately 40 dB and a Grade B contour level of 56 dBu as a desired signal are assumed. Based on these parameters the propagation attenuation of the interference path would be 44 dB, which coupled with the adjacent channel rejection would result in an interfering signal loss of 84 dB. The resulting interference signal would be 20 dBm - 84 dB or -64 dBm. The desired TV signal at the Grade B contour would correspond to 315uV into a 300 ohm load or about -89.5 dBm. However, the FCC rules at 73.684 indicate that the peak power of the visual signal is to be used for coverage predictions. The average power of the visual signal (sync plus video) is about 18% of the peak power with the greatest portion (85%) of the average power in the sync signal. This is equivalent to about 1% of the peak sync power in the video signal. The average video signal level would be 20dB less than the TV signal power level of -89.5 dBm or -109.5 dBm. The interference signal would be 45.5 dB above (about 28,000 times greater than) the average video signal level. This is in reasonable agreement with the levels discussed in the above paragraph considering variations in the adjacent channel rejection characteristics of various TV receivers.

It is recognized that the above discussed levels are those that are just perceptible and that other receivers might have better selectivity (adjacent channel rejection). ERP levels of 100 milliwatts are 100,000 times greater than the 1.0 microwatt level. A signal of 20 dB above this just-noticeable-level would become very apparent to a viewer. It would be manifested as a horizontal line covering about $\frac{1}{3}$ to $\frac{1}{2}$ of the width of the TV screen (based on EON's 15 channel system pulse lengths) each time one pulse is sent.

¹ RTT, Final Report to the FCC Phase, T-NET Technical Feasibility Tests, TM 3240-9, December 1986.

² RTT, Generic Engineering Plan for T-NET Operations in Interactive Video and Data Services (IVDS) TM1420-A, December 1992.

The above analysis considered interference when the TV receiver was located at the Grade B contour. At the Grade A contour TV signals would be 15 dB stronger and 21 dB stronger than Grade B at the City Grade contour. Although Automatic Gain Control (AGC) action reduces the TV sensitivity when stronger TV signals are present, the reduction of 21 dB occurring at the City Grade contour level would be insufficient to eliminate visible interference; but it would reduce by a noticeable amount. These potential interference effects are based on interference occurring during the visible video signal. If short length pulses (less than ten microseconds in duration) are used and are synchronized with the horizontal blanking interval of Channel 13, visible interference would not occur even if peak powers significantly exceeding 100 miliwatts were used by the mobile RTU.

The limited RTU duty cycle of 5 seconds per hour, or 1 percent per 100 millisecond, will generally reduce the publics objections to the interference because it would occur for short periods of time and not on a regular basis. There are instances where a number of mobile (portable hand held) RTUs might congregate and be used within a short period of time, i.e. conclusion of a party. This would effectively increase the overall duty cycle that a nearby TV might receive in the way of interference. A viewer of Channel 13 would find such interference more objectionable than that of a single source. Further, a viewer may be receiving acceptable interference from a fixed RTU, but the addition of interference from a mobile RTU may now make the situation objectionable. However, a mobile RTU might be used at various locations and a single viewer might not be subject to interference from any single RTU for a significant time period. This would suggest that higher duty cycles might not cause objectionable interference.

The potential for objectionable interference to TV Channel 13 from an RTU depends on the relative strengths of the desired and interference signals, the duty cycle of the RTU, subjective considerations of the viewer, and the timing of the interfering signal with respect to the TV signal waveform. Interference effects can be minimized or eliminated by addressing each of the above factors individually or in combination. The strength of the interfering signal relative to the desired TV signal can be reduced by reduction of, or limitation on the RTU power, by an adjacent channel filter at the TV set or by increasing the RTU to TV receiver distance. TV set operating nearer to the Channel 13 transmitter receive stronger TV signals than those further away and would be subject to less objectionable interference. Limiting the duty cycle of the RTUs minimizes the effect of interference by causing infrequent occurrence which the viewer may not perceive as being objectionable. Allowing RTUs to only transmit during the blanking intervals of TV Channel 13 produces interfering signals that are not visible or audible to the viewer and are, therefore, not perceived as objectionable interference unless the interference signals are of considerable intensity. In such cases horizontal sync could be momentarily lost or the color could be effected.

A licensee is required to respond to and rectify any interference complaints in his or her service area. Use of mobile RTUs, as noted above, can cause interference which would be objectionable to the viewer. The viewer would then notify the licensee who would be obligated to investigate and correct the situation. Because the interference might be caused by a mobile RTU(s) which is no longer in the vicinity, the investigating licensee would be unable to determine the cause of the interference but would probably put in a filter to avoid future calls. There is a good chance that the responding licensee may be taking action as a result of the other

licensees subscriber's mobile RTU causing the interference. If both licensees provide mobile service, the cost of responding to such situations might balance. If only one licensee provides mobile service, the other licensee would bear an undue cost burden in responding to interference situations where the source is initially unknown but turns out to be from a mobile RTU. Further, because the RTUs are mobile, a subscriber in one MSA or RSA may use the RTU in another MSA or RSA in spite of the implied prohibition in the proposed rules.³ If interference occurred and was reported to a licensee in the "foreign" MSA or RSA, that licensee would incur the cost of investigating and perhaps filtering even though his licensed facilities were not involved. These issues concerning licensees responsibility for interference control are not addressed in the rule modifications.

III. IVDS SYSTEM CONSIDERATION

The use of mobile units with a 100 milliwatt power limitation is based on the system proposed by EON. This system contains a number of cell sites, each of which can support 14 remote receivers. The original system was designed to operate with fixed RTUs.

Mobile and/or hand held RTUs must operate in various locations under a variety of conditions. In order for a licensee to offer a viable mobile service, even on an ancillary basis, the system should provide good reliability in the coverage area. This includes operation in homes in office buildings, in cars, on public transportation, in underground parking garages, etc. With hand held RTUs, building penetration, absorption of RF energy by the body and shielding caused by operation within a vehicle are factors which can significantly reduce signal strength. For example, in the public safety area portable units operating in buildings in the VHF and UHF region (frequencies below 500 MHz) within buildings with powers of 600 milliwatts to 1 watt have difficulty communicating and in many instances cannot communicate with other portables outside the building. Office buildings and shopping centers can exhibit losses of 20 dB (1/100 of the power), while body losses can contribute an additional 6 to 10 dB (1/4 to 1/10 of the power) in the 200 MHz region. Loss for operation inside of cars can be comparable to building loss. In addition, multipath propagation can cause reduction of signal strength at various locations.

The power limit of 100 milliwatts could tend to preclude reliable use of hand held mobile RTUs in office buildings, cars, underground parking lots, shopping centers and other areas. Building penetration and body absorption factors can reduce signal level below useable values at remote receiver sites which are configured for use with fixed RTUs. The use of additional remote receivers would be necessary to alleviate this problem. In the case of an EON system, because a CTS can handle a limited number of remote receivers, additional CTS's would be required. The infrastructure cost to handle mobile RTUs could increase by a significant amount for an "ancillary service."

³ See proposed amendment to Section 95.803(b) and 95.805(e).

Increasing the number of CTS's and remote units to ensure in-building and in-vehicle coverage reliability would result in small area of coverage for remote receivers. An RTU operating from a vehicle might not complete a message transmission during transit through an area of coverage of one remote receiver and involvement of several remote receivers may be required to complete a message. Some type of hand off arrangement would have to be available, which would further increase system costs.

The power limit of 100 milliwatts would also preclude use of systems from manufacturers other than EON, whose infrastructures are based on higher power RTUs, unless they would drastically alter system design. This too would cause significant increases in costs for "ancillary" service.

The additional overall infrastructure costs of providing ancillary mobile service with RTUs limited to 100 milliwatts, would cause an increase in rates that licensees would have to charge fixed subscribers.

IV. SPECIFIC COMMENTS

Providing mobile services in addition to fixed service within a licensee's service area is a desirable goal and would enhance telecommunication offerings of an IVDS licensee. Public interest would be served by broadening IVDS service offerings.

There can be a potential for increased interference as a result of mobile RTUs. A licensee is required to respond to and rectify interference complaints, but mobile operation makes it difficult to determine whether the A or B segment system caused the problem. Favorable Commission action on the Petition for rulemaking of the Interactive Television Association of October 21, 1994 concerning amendment of Section 95.813(b)(1) to delete the prohibition on ownership of two IVDS system licenses in the same market would aid in this respect. Cooperation between the two licensees or joint ownership would make it considerably simpler to cope with interference complaints. In cases where licensees choose to operate as separate entities it may still be advantageous for them to operate a joint operation to handle interference problems. The Commission should take action to ensure that such arrangements are acceptable within the Rules.

If a licensee chooses to provide ancillary mobile service, the 100 milliwatt limit on mobile RTUs forces the adoption of one technology. This is anti-competitive and not in the public interest. The Commission should not promulgate rules that favor a single vendor's technology. Further, because of building penetration, body absorption, etc. problems, this power limit would require significant increases in infrastructure costs as discussed earlier.

The Commission also requested a "comment on the need to continue to authorize 20 watts power for fixed RTUs, given their apparent ability to operate at 100 milliwatts." As noted above, this is anti-competitive. Further, licensees obtained their licenses through the competitive bid process with the understanding that the 20 watt RTU power limitation as stated in the rules applied. A number of licensees have or are in the process of ordering systems with RTU power greater than 100 milliwatts from companies other than EON. To attempt to limit fixed RTU

power to anything less than 20 watts would be considered to be a breach of the auction terms and could subject the FCC to legal action instituted by the licensees. This would not be in the public interest because delays in the implementation of IVDS service would result. CTO is therefore, opposed to further limitations on fixed RTU power.

As pointed out in Section II, there are a number of ways to avoid objectionable interference. Allowing fixed or mobile RTUs to operate only during a blanking interval of Channel 13 with powers higher than 100 milliwatts would produce few if any objectionable interference cases. Other interference reduction techniques are possible which would minimize objectionable interference. System could be designed for mobile use by companies other than EON which could be implemented with RTUs, both fixed and mobile, operation at 100 milliwatts. This would require a proliferation of CTS's which would be unnecessary from an interference standpoint. Cost of the infrastructure would increase dramatically with no improvement in service. The increased cost to potential subscribers might be so high that they would not be interested in obtaining the services of IVDS. This is clearly not in the interest of the licensees or the public.

The 5-second-per-hour duty cycle limitation that the Commission proposes for mobile RTUs is the same duty cycle limitation that is in the rules for fixed RTUs. Since the mobile RTU can be in various locations, the interference effects on any particular TV set would only occur for the period of time during which the mobile RTU is within interference range of that TV set. The interference would occur for a brief period of time and probably not be objectionable regardless of the duty cycle. The exception to this is when a number of different mobile RTUs transmit in a short time frame from one location as cited in the example in Section II. In that case the "apparent" duty cycle (that seen by the TV) could be exceeded regardless of the duty cycle limitation placed on an individual mobile RTU.

The licensee has the responsibility of rectifying objectionable interference cases. He or she has a number of methods, in addition to limiting the duty cycle, to control interference as discussed in Section II. The licensee could, on a dynamic basis, control the duty cycle of each mobile RTU communicating with a specific remote receiver. If the mobile RTU has reached its duty cycle limit in one location and moves to a different location which changes the remote receiver involved, the RTU would be free to transmit again starting a new duty cycle. Also, interference effects are reduced as RTUs operate closer to Channel 13 transmitter. The duty cycle could be greater without causing interference. Transmitting from RTUs only during Channel 13 blanking intervals is another way of not causing objectionable interference which does not require a duty cycle limitation.

Where an IVDS service area does not overlap a Channel 13 protected Grade B coverage area, both restrictions limiting mobile RTU power to anything less than fixed RTU power and duty cycle limitation for fixed or mobile RTUs are unnecessary because no objectionable interference to Channel 13 would occur. The rules should be modified to remove the limitation in such cases.

The rules specify that CTS's (which do not have duty cycle limitations) must be 200 feet away from a residence with less distance if reduced power is used. This rule was adopted to avoid Channel 13 interference as were the power and antenna height limitations associated with operating within various TV contours. In the case of business applications where a fixed RTU is located 200 feet or more from a residence (or with reduced power at closer distance) it would seem that the same rules used for a CTS should apply. The Commission should amend the rules to reflect such a change. This would allow licensees to have more flexibility to provide better service for business interactive data applications. This would increase the viability of operations in a market and also allow for less costly consumer services.

The Commission has proposed allowing "mobile relay" or "bent pipe" indirect RTU-to-RTU interaction. This is a feature which would enhance services to the public and should be adopted.

Again, it is stressed that the licensee is responsible for controlling interference. The Commission should modify rules in a manner which gives the licensee maximum flexibility to carry out this responsibility and not burden the licensee with unnecessary rules that are costly to implement and which will produce no additional benefit to the public.

Respectfully submitted,

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By:



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Dated: June 23, 1995